Claims

1. A method for determining the corrosion of a material in an environment using a corrosion coupon placed in the same environment, comprising the steps of:

(a) placing said corrosion coupon in said environment;

(b) sensing the failure of said corrosion coupon, wherein said failure is indicated by a movement of a magnet, creating a magnetic field which may be sensed without effecting said material;

(c) sensing said magnetic field, wherein said magnetic field has a characteristic indicative of said failure, thereby producing a measurable external magnetic field at a distance from said corrosion coupon; and

(d) responding to said external field to display an indication of said failure.

2. A method as recited in claim 1, wherein said method measures the amount of corrosion because the physical condition of the corrosion coupon is known before the coupon is inserted into said environment.

3. A method as recited in claim 2, wherein said method measures the rate of corrosion because the time to failure while in said environment is determinable.

4. A method as recited in claim 1, wherein the failure of said coupon is determined without penetrating a wall separating the location of said coupon from the location of said display.

5. A method as recited in claim 1 wherein said method uses a plurality of corrosion coupons.

6. A method as recited in claim 1 wherein said material to be monitored for corrosion is located in a radioactive environment containing an element selected from the group consisting of plutonium and uranium.

7. A method as recited in claim 1 wherein said magnet is moved by a spring attached to said coupon that is in compression until the coupon fails.

8. A method as recited in claim 7 wherein said spring applies a compressive force to said

coupon.

9. A method as recited in claim 1 wherein said magnet is moved by a spring attached to said coupon that is in tension until the coupon fails.

10. A method as recited in claim 10 wherein said spring applies a tension force to said coupon.

11. A method as recited in claim 1 wherein said magnet is moved by Belleville washers under compression and applying stress to said coupon until said coupon fails.

12. A method as recited in claim 1 wherein said magnet is moved by Belleville washers under tension and applying stress to said coupon until said coupon fails.

13. A method as recited in claim 1 wherein said responding includes a magnet positioned exterior to said container aligning itself with said exterior magnetic field.

14. A method as recited in claim 1 wherein said responding includes at least one coil that can be used to sense said exterior magnetic field.

15. A method as recited in claim 1 wherein said responding includes a magnetoresistive device that can be used to sense said exterior magnetic field.

16. An apparatus for determining the corrosion of a material in an environment, using a corrosion coupon placed in the same environment, comprising:

(a) transmitter apparatus for placement in the environment containing said material, including

(i) a corrosion coupon mounting system with at least one with corrosion coupon;

(ii) a transducer apparatus responsive to the position of each coupon to provide a corresponding position of a mechanical element;

(iii) a transmitter magnet attached to each element for radiating a magnetic field characteristic corresponding to the position of each element, said magnetic field including an external magnetic field component that can

be sensed at a distance from said element;

(b) receiver apparatus for placement at a distance from the transmitter apparatus, said receiver apparatus including

(i) receiver magnetic field sensing apparatus that measures a detectable characteristic of said external field component;

(ii) a display apparatus responsive to a position of said receiver magnet to provide an indication of said position.

17. An apparatus as recited in claim 16 wherein said receiver magnetic field sensing apparatus includes a receiver magnet that aligns with said external field component.

18. An apparatus as recited in claim 16 wherein said display apparatus is a mechanical display.

19. An apparatus as recited in claim 16 wherein said display apparatus is a needle gauge.

20. An apparatus as recited in claim 16 wherein said display apparatus is an electronic display.

21. An apparatus as recited in claim 16 wherein said transducer apparatus produces a rotational movement in response to a failure of said corrosion coupon.

22. An apparatus as recited in claim 16 wherein said transducer produces a translational movement in response to a failure of said corrosion coupon.

23. An apparatus as recited in claim 21 wherein said receiver apparatus senses the external magnetic field of the rotational movement produced by said transmitting apparatus.

24. An apparatus as recited in claim 22 wherein said receiver apparatus senses the external magnetic field of the translational movement produced by said transmitting apparatus.

25. An apparatus as recited in claim 16 wherein said receiver apparatus is a coil that senses said external magnetic field component.

26. An apparatus as recited in claim 16 wherein said receiver apparatus is a magnetoresistive sensor that senses said external magnetic field component.

27. An apparatus as recited in claim 25 wherein said receiver apparatus includes a display of said sensed external magnetic field.

28. The apparatus of claim 16 wherein said transducer produces a rotational movement in response to a failure of said corrosion coupon.

29. The apparatus of claim 16 wherein said transducer produces a translational movement in response to a failure of said corrosion coupon.